

Hubble Space Telescope (HST) Vision 2000 Control Center System (CCS)

System Monitoring (SYM) Subsystem

Analysis and Trending Functional Requirements

Version 0.5

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Abstract

This document presents the functional requirements for the Hubble Space Telescope (HST) Vision 2000 Control Center System (CCS) analysis and trending function, hereafter known as VTREND. VTREND shall be the primary mechanism for performing retrieval and analysis of HST engineering telemetry data. This function shall be built with the commercial, off-the-shelf (COTS) software package PV-WAVE from Visual Numerics Inc.

Foreword

Draft Version 0.1:

This is our first attempt to identify the requirements for CCS analysis and trending in a format that we're all accustomed to seeing.

This document is still in a draft state. We've reached a point where we need to get reactions from the groups whose software will be interfacing with the analysis software. We are aware that there are a number of places where information may be omitted. If anybody has comments or suggestions, please bring them to our attention. We will be making assumptions as to which group will be doing certain portions of the workload based on what we've stated in the proceeding requirements. If there are any problems that rise because of those assumptions, we need to know as soon as possible.

Please contribute your knowledge and expertise by providing comments, suggestions, etc., as soon as possible. After we have received some feedback, we are going to move ahead with the design of the analysis and trending application. If you have particular ideas, needs, favorite DLPs -- whatever -- now is the time to communicate these things to us.

We appreciate your patience and your contributions.

John Boia
Erica Mushovic

April 1996

Draft Version 0.2:

We have made some changes and incorporated comments from Richard Chu, Gary Welter, and Ray Deyton, and begun expanding Section 2 (Retrieve Data) based upon meetings with the Data Management folks. We still have some items to complete. Any further comments will be appreciated.

John & Erica, 6 May 1996

Draft Version 0.3:

We have made changes and incorporated comments from Dave Fish, and continued expanding Section 2.

Draft version 0.4:

Changes were made based on comments received from numerous SE's. Some comments have not yet been incorporated into the paper. Please check the new suggestions section at the end of this document to see those comments. We will be addressing these items in the near future.

June 26, 1996

Version 0.5:

Comments received from Betty Colhoun have been incorporated into the paper.

September 17, 1996

Preface

This is a living document and it is intended to be a working description of the analysis and trending application. It is not a formal document. It is not a promise to anyone to incorporate all of the items described herein. It is intended to be a guiding influence in the design and development of the application, to remind the developers about the needs and priorities of the end users.

VTREND is only a working name for the analysis and trending application. No formal name has yet been assigned to it. Any suggestions for a name will be welcomed.

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0. Overview

This document describes the functional requirements for the analysis and trending tool, hereafter known as VTREND, in support of the Hubble Space Telescope (HST) Vision 2000 Control Center System (CCS).

VTREND shall fulfill the requirements and definitions set forth by the Top-Down Architecture team under “Perform Analysis” (3.5).

VTREND shall be developed primarily with the commercial, off-the-shelf (COTS) software package PV-WAVE™ from Visual Numerics Inc (VNI). PV-WAVE was selected based on the results of a prototyping and evaluation effort¹ conducted prior to the design phase of CCS development. Additional functionality shall be provided as needed by new custom code written in C++ or Java™, legacy code written in FORTRAN or C, or IDL™ procedures converted from LoTTS.

The hierarchy of VTREND operation is described as follows. Requests for plotting or analysis of data shall be created electronically, either by user request or automated process. VTREND shall receive these requests and, in turn, generate requests for data to be retrieved from the CCS data archive. Retrieved data may be filtered or processed before plotting or analysis is performed. VTREND shall generate products such as plots, text reports, or data streams which may be stored, printed, or transmitted electronically to users or other CCS entities. Overall control of VTREND shall be provided by a graphical user interface (GUI) or a forms-based hypertext document viewed on a World-wide-web browser such as Netscape Navigator™.

0.1 Hubble Space Telescope

The requirements contained within this document must address the analysis and trending needs of the HST subsystems listed in Table 0-1.

Table 0-1. HST subsystems

Acronym	Description
DMS	Data Management Subsystem
EPS	Electrical Power Subsystem
I&C	Instrumentation and Control
OTA	Optical Telescope Assembly
PCS	Pointing Control Subsystem
S&M	Structures and Mechanisms
SAF	Safemode / Pointing and Safemode Electronics Assembly (PSEA)
SI	Science Instruments
TCS	Thermal Control Subsystem

¹ Boia, J. & Mushovic, E. *Evaluation of Analysis and Trending Products for the Hubble Space Telescope (HST) Vision 2000 Control Center System (CCS)*, NASA/Goddard Space Flight Center, March 1996.

0.2 Control Center System

The following CCS subsystems will have interfaces with the analysis and trending subsystem:

- Graphical User Interface (GUI) Server
- Data Management (Data Server/Archive)
- Real-time Monitoring
- Background Monitoring
- Legacy Applications

0.3 Interactive Processing

VTREND shall be capable of supporting interactive processing by members of the flight operations team (FOT) via a graphical user interface (GUI) with online help, as described in section 7.

0.3.1 Graphical User Interface

VTREND shall provide a graphical user interface (GUI) for interactive processing.

0.3.2 Help

VTREND shall provide on-line help for interactive processing.

0.4 Automated Processing

VTREND shall be capable of supporting automated processing, to be initiated by an expert system that performs autonomous monitoring of the spacecraft. Monitoring will be performed in real-time on real-time telemetry data, and as a background process on archived telemetry and trend data.

1. Process Request

VTREND shall accept requests for data analysis. Requests may be generated manually by the VTREND User Interface (VUI) or automatically by the CCS monitoring system. Data analysis may be performed on the data types listed in Table 1-1, specified by unique mnemonics². VTREND shall receive, validate, log, and execute requests, returning the result to the requesting entity in the desired format.

Table 1-1. Types of data available for analysis

Data Type		Description
TLM	Engineering telemetry	Downlinked measurements from the HST onboard computer (OBC)
DVP	Derived parameters	Measurements that are constructed or computed from telemetry data or database constants. Includes General Equations and OTA Equations.
ICS	Integrated command schedule	Predicted or scheduled events
CCS	CCS system usage data	Number of users, CPU time, free/used disk space, network throughput, etc.
GSD	Ground system data	Status information about communication lines to NASCOM and White Sands Complex (WSC)
TRN	Trend data	<ul style="list-style-type: none"> Time-averaged telemetry data Number of times an event occurred (e.g., tape recorder on/off) Statistical or numerical information about an event (e.g., computed error of each FGS guide star acquisition for a given day) Additional types TBD
USR	User-supplied data	TBD

² Specific data items for ICS, CCS, GSD, and TRN types are TBD.

1.1 Receive Analysis Request

VTREND shall receive analysis requests, either manually from the user or automatically from the CCS monitoring system, containing the following information:

- Time Range shall be specified, to millisecond precision, as *either*:
 - a start time and stop time; *or*
 - a start time and a duration (see section 7.1.1)
- List of measurements
 - Measurement and stimulus identifier (MSID)
 - Mnemonic
- Data filtering criteria
 - Data type: changes-only telemetry(default), all-points telemetry, or trend data
 - sampling frequency: every n -th point
 - sampling period: every t seconds
 - A message will be posted if the requested sampling period is shorter than the period for telemetering the measurement(s).
 - Culling Algorithm: minimum, maximum, and mean value every t seconds for the specified time range
 - Option to include corrupted data based on quality flags

1.1.1 Request Output Products

VTREND shall provide the option to the user to request the generation of various output products.

1.1.2 Plots

VTREND shall provide options to generate plots of selected measurements in various formats, as described further in section 5.1.

- Customize
- Display plots on line.
- Print
- Save to plot definition file.

1.1.3 Reports

VTREND shall provide options to generate reports of selected measurements, as described further in section 5.2.

- Customize
- Display
- Print

- Save to an ASCII file
- Option to include flags associated with the data (quality, static, etc.)
- Option to use the words “DROP OUT” to indicate data gaps

1.2 Validate Analysis Request

VTREND shall validate all requests prior to submitting to the database, using the criteria listed in Table 1-2:

Table 1-2. Validation Criteria

Criterion	Description
Time	The start time of the request must be earlier (less) than the stop time.
Mnemonic	Each requested mnemonic must be valid for the time range/PRD version specified.
Products	At least one product (a plot or report) must be specified.

If a request is not valid, it may need to be modified. A message will alert the user and force either cancellation or change.

If the duration of a request exceeds 24 hours, VTREND shall prompt the user to confirm the request before it can be submitted for processing, in order to prevent erroneous time ranges from causing the system to slow down.

1.3 Log Analysis Request

VTREND shall assign a unique identification number to each valid analysis request and store the event in a cumulative log . The status of each request will be viewable via the user interface during and after execution.

1.4 Execute Analysis Request

VTREND shall execute validated analysis requests and return the results to the requesting entity.

2. Retrieve Data

Data may be retrieved only from the Data Management (DMG) sub system, hereafter known as “the archive.” **Any information provided in this section is subject to change as the interface between the archive and the analysis tool is defined.**

2.1 Retrieve Project Database (PDB) information

VTREND shall form a request for project database (PDB) information, primarily focusing on information pertinent to telemetry downlink format definition.

2.1.1 Version List

VTREND shall query the project database for version history information, including:

- version number (e.g., “PDB42A”)
- start date/time
- end date/time.

2.1.2 Mnemonic Information

VTREND shall query the CCS database for Project Reference Data (PRD) information about mnemonics, as described in Table 2-1.

Table 2-1. PRD Information

Information item	Sample data
Mnemonic	QRGACTS
MSID	Q403
Description	RGA 1 Gyro Counts
Engineering units	d/hr
String conversion table	N/A
EU low limit	-10125.30
EU high limit	+10125.30
PCM low limit	0
PCM high limit	65280

2.2 Form Telemetry Request

VTREND shall form a Telemetry Request for data to be retrieved from the archive. A Telemetry Request is defined as a list of measurements desired for a single time range with filter options.

2.2.1 Time Range

VTREND shall specify one time range per data request. The format of the time range is TBD.

2.2.2 List of Measurements

VTREND shall specify a list of measurements by mnemonic, MSID or numeric primary key. Measurements shall be for any of the data types listed in Table 1-1. A general description of all available HST telemetry mnemonics is provided in DM-02, with calibration coefficients in DM-14.

It is anticipated that ICS, CCS, and ground system data will be stored as time-series values in a similar manner as telemetry data are stored. This would make it much easier for the analysis tool to retrieve data and perform comparisons or computations on all of these items.

2.2.3 Filter Parameters

VTREND shall allow filtering of data based upon user-specified parameters, as described in section 3.

2.3 Submit Telemetry Request

VTREND shall submit Telemetry Requests to the Data Server.

2.4 Receive Telemetry Response

VTREND shall receive a response from the Data Server. The response shall indicate either (1) successful retrieval of data, or (2) rejection of the request.

2.4.1 Retrieved Data

A successfully completed Data Request will result in a response from the telemetry archive server indicating that data have been prepared for use by the requesting application. The exact format of the retrieved data is TBD. It may be a file, or a path to a file, or a socket data stream, or something else.

2.4.2 Rejection Notice

The DMG system shall respond with a rejection notice if it cannot fulfill the Data Request. Possible reasons for rejection are:

- Data Unavailable
- Subsystem Unavailable

Upon receipt of a rejection notice, VTREND shall notify the requester that the analysis request cannot be fulfilled, give the reason why and notify the user of what happens. What exactly will happen is TBD.

3. Filter Data

VTREND shall make filtering options available to the user via the user interface or otherwise. However, it is expected right now that the DMG will be doing ALL the data filtering itself.

3.1 Type filter

VTREND shall allow the user to specify the type of data to be retrieved. Valid types are: changes-only telemetry data (default), all-points telemetry data, and trend data,

3.2 Quality Filter

VTREND shall allow the user to specify that data from “bad minor frames” may be included in the retrieved data set. By default, bad quality data are not retrieved.

3.3 Sampling Filter

If the type of data being retrieved is “all-points telemetry data,” then VTREND shall allow the user to sample all-points data every n -th point, every t seconds, or via a culling algorithm (TBD). By default, $n=1$ -- use all points in the retrieved time range. Sampling is not performed on changes-only or trend data.

3.4 Source Filter

VTREND shall select data based on the source of the telemetry (real-time, merged, playback, simulated) or the telemetry format (AN, HN, FN, etc.).

3.5 Event Filter

VTREND shall filter data based on mission events (orbit day/night transition, orbit ascending/descending node crossing, solar array slew, etc.). In general, additional measurement data will be needed to perform this type of filtering.

4. Process Data

VTREND shall perform requested analysis and trending upon data received from the archive. Data processing shall be performed via PV-WAVE procedures and/or algorithms developed in external code. Legacy algorithms may be coded in FORTRAN, C, or IDL. Newly-developed custom code must be in C++ or Java.

4.1 Perform Analysis

VTREND shall perform analysis on selected measurements during the specified time range. VTREND shall have the ability to perform statistical, numerical, comparative, and graphical analysis.

Analysis refers to automatic (system-initiated) and manual (FOT-initiated) activities performed to investigate the condition of the spacecraft/ground system or the CCS. Analysis may be initiated for the purpose of anomaly investigation, long-term trending, system usage metrics, processing rates, or other comparable reasons.

4.1.1 Perform Statistical Analysis

VTREND shall calculate statistical information for each selected measurement during a specified period of time. These statistics shall include:

- minimum value, time of minimum value
- maximum value, time of maximum value
- mean, standard deviation, number of samples
- median

VTREND shall optionally provide statistical information as header information on a plot and/or as a separate text report.

4.1.2 Perform Numerical Analysis on Telemetry

VTREND shall perform numerical analysis on selected measurements during a specified period of time. These functions shall include:

- Least-Squares Fit to Polynomial (order 0 [mean] through 9)
(Results shall be returned as a set of coefficients, a time-series of values, or both)
- Interpolation/Extrapolation
- Fast Fourier Transform (FFT)
- Power Spectral Density (PSD)
- Root-Mean-Square (RMS)
- Root-Sum-Square (RSS)
- Data smoothing/moving average
- Time derivative
- Conversion to Other Engineering Units (e.g., °C ↔ °F)
- Gyroscope-to-vehicle transformation

- Add two or more mnemonics
- Subtract one mnemonic from another mnemonic
- Multiply two mnemonics
- Conversion of telemetry diagnostic points (TLMDIAG)

4.1.3 Perform Comparative Analysis on telemetry

VTREND shall perform comparative analysis on selected measurements. These functions shall include:

- Standard mathematical operations and logic evaluation using keywords defined in Table 4-1

Table 4-1. Math and Logic Keywords

IF-ENDIF	Conditional Evaluation
WHILE, WHEN	Conditional Iteration
AND	Logical Union
OR	Logical Intersection
+	Addition
-	Subtraction
*	Multiplication
/	Division
^	Exponentiation
==	Equality
<>	Inequality
>	Greater Than
<	Less Than
>=	Greater Than or Equal To
<=	Less Than or Equal To

- Derived parameter calculations
- Limit Violations

4.1.4 Event-Driven Trending

VTREND shall perform limited event-driven trending. If a real-time mnemonic hits a threshold or meets a criteria, a canned extraction will fire. For example, the user may wish to perform jitter calculations based on RGA-only or RGA/FGS control mode and/or day/night transition events.

4.1.5 Perform Graphical Analysis

VTREND shall perform graphical analysis (generation of plots) for selected measurements. Details of plot generation are discussed fully in section 5.1.

4.2 Perform Trending

Trending refers to examining historical (near- or far-term) data for the purpose of identifying patterns within the data. Trend-based monitoring is used to perform more intelligent fault detection; trend-based analysis is used to establish knowledge of patterns within the data examined.

Trending requirements are TBD.

5. Generate Products

VTREND shall generate analysis products.

5.1 Generate Plots

VTREND shall generate plots of selected measurements in various formats. VTREND shall provide pre-defined and user-defined plot format definitions. These formats shall include

- Plot of measurement vs. time (y vs. time)
 - Display time as calendar, GMT, or elapsed seconds/minutes/hours/days
 - Always show data gaps via a “pen-up” line break
- Plot of measurement vs. measurement (y vs. x)
 - Scatter plot
 - Connected by line
- Alternative plot formats
 - Bar graph
 - Pie chart
 - Three-Dimensional (3D) plot

VTREND shall allow plots to be customized, displayed, printed, and/or saved to a file.

5.1.1 Customize Plots

VTREND shall allow user customization of plots based on the following criteria:

- Number of graphs per plot
- Number of plots per page
- Page orientation (landscape, portrait)
- Axis scaling
- Multiple scales per plot
- Grid lines
- Labeling for titles, axes, and legends
- Colors
- Symbols and line styles
- Display of statistical information (min, max, mean, std. dev., etc.)
- Display of data source (real-time, ETR, SSR, etc.)

5.1.2 Display Plots

VTREND shall display plots on any of the following display systems:

- X Windows capable device
- Web browser capable of graphics support

5.1.3 Print Plots

VTREND shall print plots on any of the following hardcopy devices:

- PostScript printer

5.1.4 Save Plots

VTREND shall save plots to any of the following file types:

- PostScript (PS)
- Graphical interchange format (GIF)
- Tag image file format (TIFF)
- Joint photographic experts group (JPEG)
- Portable data format (PDF)

VTREND will also save plot definition objects.

5.2 Generate Reports

VTREND shall generate reports to be displayed, printed, or saved to an ASCII text file.

5.2.1 Prepare Summary Information

VTREND shall optionally provide summary information with each report generated. Summary information for each measurement shall include:

- Time range (start and stop)
- Mnemonics and associated MSID
- Measurement units or other indication of EU conversion
- Sampling method used (all points, changes only, n points, t seconds)
- Statistical summary (min, max, mean, std. deviation, number of points)
- Limits (User- or PDB-specified)
- Data Source
- User-provided description

5.2.2 Prepare Main Report

VTREND shall generate a main report that shall be customizable by the user. This report shall include one or more of the following items:

- Summary Information, as described in section 5.2.1
- Statistical analysis results, as described in section 4.1.1

- Numerical analysis results, as described in section 4.1.2
- Comparative analysis results, as described in section 4.1.3
- Column-ordered table of times and data values
- Delimiter type (comma, tab, space, etc.)

VTREND shall, in general, allow reports to be displayed, printed, or saved to an ASCII text file.

5.2.3 Display Reports

VTREND shall display reports on the devices listed in Section 5.1.2.

5.2.4 Print Reports

VTREND shall print reports to an ANSI printer. If the report is sent to something other than an ANSI printer, an error message will be sent to the user.

5.2.5 Save Reports

VTREND shall save reports to a file. Possible file types are:

- Formatted text file
- Spreadsheet-compatible file with a user-selected character delimiter.
(e.g., Formatted text files with data delimited by tab, comma, or space)

6. Transmit Products

VTREND shall return the requested analysis and trending products to the requester upon completion.

6.1 Transmit Products to Destination

VTREND shall route analysis products to the requested destination. Valid destinations shall be:

- File
- Display
- Printer
- Internet e-mail address
- Pipe, Named Pipe, Socket
- Interprocess Communication (IPC) via middleware
- Archive

7. User Interface

The VTREND User Interface (VUI) shall provide the capability for the user to control the analysis software from any machine that supports the run-time environment (i.e., any machine that can run Netscape and Java).

7.1 Telemetry Archive Request

The VUI shall provide the capability for the user to interactively modify or form the contents of each field of a request.

7.1.1 Time Range

The VUI shall provide the user the capability to specify the start time and stop time of the request, or start time and duration, in a user-friendly format

7.1.2 Type of Data

The VUI shall allow data to be retrieved as time-series values or as trend data.

7.1.3 Measurements

The VUI shall provide the user with the capability to specify measurements, either via mnemonic or measurement identifier (MSID). Acceptable measurement data are as listed in section 2.2.2.

The VUI shall provide the capability to search for a mnemonic by

- Mnemonic Name
- MSID
- Description
- Subsystem
- Numeric Primary Key

7.1.4 Data Conversion

The VUI shall allow data to be retrieved as raw values, engineering units (EU)-converted values, or (if applicable), as character-converted (string) values.

7.1.5 Sampling Rate

The VUI shall provide the user with the capability to specify sampling rates:

- all points
 - every n -th point
 - every t seconds
- changes only
- culling algorithm

7.1.6 Bad Quality Data

The VUI shall provide the user with the capability to optionally include bad quality data.

7.1.7 PDB-defined high/low limits

The VUI shall provide the user with the capability to request PDB-Defined high/low limits to be displayed in the plot or report header. The limits will be indicated graphically on a plot.

7.1.8 User-defined high/low limits

The VUI shall provide the user with the capability to define high/low limits to be displayed in the plot or report header. These limits will be indicated graphically on the plot.

? What about the limits that are dynamic?

7.1.9 Telemetry Flags

The VUI shall allow the user to request that telemetry flags be included with each telemetry value. By default, flags shall not be included.

7.1.10 Derived Parameters

The VUI shall provide the capability for the user to request PDB-defined derived parameters or to specify user-defined derived parameters.

7.1.11 User-supplied Algorithm

The VUI shall provide support for user-supplied algorithms. The VUI shall provide the capability to utilize data contained within a dataset as input into a user supplied algorithm. The user supplied algorithm should be in the PV-WAVE programming language.

7.2 Filter Data

The VUI shall provide the capability for the user to filter data as described in section 3.

7.3 Process Data

7.3.1 Statistical Analysis

The VUI shall provide the capability for the user to request math or statistical data, as described in section 4.1.1.

7.3.2 Numerical Analysis

The VUI shall provide the capability for the user to request numerical analysis, as described in section 4.1.2.

7.3.3 Comparative Analysis

The VUI shall provide the capability for the user to request comparative analysis, as described in section 4.1.3.

7.3.4 Graphical Analysis

The VUI shall provide the capability for the user to request graphical analysis, as described in section 4.1.5.

7.4 Output Products

The VUI shall provide the capability for the user to request various output products.

7.4.1 Text Reports

The VUI shall provide the capability for the user to request test reports in various formats:

- Displayed
- Printed
- Saved to an ASCII File
- Spreadsheet-compatible files (delimited columns of data)

7.4.2 Graphical Plots

The VUI shall provide the capability for the user to request graphical plots in various formats:

- Displayed
- Printed
- PostScript (PS)
- Graphical interchange format (GIF)
- Tag image file format (TIFF)
- JPEG
- PDF

7.4.3 Trend Data

The VUI shall provide the capability for the user to request min-max-mean reduced data sets or plots.

7.4.4 Spreadsheet-compatible Files

The VUI shall provide the capability for the user to request delimited text files.

7.4.5 Plot Types

The VUI shall provide the capability for the user to specify the plot type when a plot is requested. A default shall be provided which is line (versus time). See section 5.1 for the plot types that will be supported.

7.4.6 Plot Capabilities

The VUI shall provide the capability for the user to request the following plot capabilities:

- Changes-only data (default)
- All Points Data
- 'Pen-Ups' at Data Gaps(default)
- Zoom In/Out

- Request TLM Flags
- Data Limits Displayed
- Statistics on Plot
- User Defined Limits
- Customization of Plot (title, axis labels, axis scale, colors, symbols, grid lines, error bars, tick marks, plot legend, page orientation, multiple plots per page, multiple curves per plot, multiple scales per plot, dynamic modification of plot format, measurement vs. time, measurement vs. measurement, 3D plots bar graphs/pie charts/alternate formats)
- The user shall be provided the capability to request to display the event log.
- The user shall be provided the capability to request to display a filtered event log.

7.4.7 Run Description

The VUI shall provide the user the capability to provide a run description to be associated with the results of the execution of the request. The user-provided run description shall be the basis of searching for products that are associated with the run.

7.5 Request Management

The VUI shall provide template management for requests.

7.5.1 Requests

- The VUI run files shall include the contents of a request.
- The VUI shall provide the capability for the user to create requests.
- The VUI shall provide the capability for the user to save requests.
- The VUI shall provide the capability for the user to modify the contents of previously saved requests.
- The VUI shall provide the capability for the user to display or print a list of requests which have been saved.
- The VUI shall provide the capability for the user to delete an entry from the list of saved requests.
- The VUI shall provide the capability for the user to print requests.

7.6 Job Management

7.6.1 Display Request Queue

- VTREND shall provide the capability to display the queues for current in-process analysis requests.
- VTREND shall provide the capability to display the status of an analysis request. The status shall include whether the request is pending, executing, or complete. The status shall also include the job priority level.

7.6.2 Manage Request Queue

- VTREND shall provide the capability to delete entries from the queue for current in-process analysis requests.
- VTREND shall assign job priority levels based on whether a request is automated, manual, or scheduled. Automated requests from the Real-time Monitoring system shall receive highest priority.
- VTREND shall provide the capability for the user to select a priority level for the analysis request at submittal time. The user shall have a range of possible priority levels to select from based on the request source (i.e., automated, manual, or scheduled).
- VTREND shall provide the capability for a privileged user to raise or lower the priority of analysis requests currently in the queue.

7.7 Scheduling

The user shall be provided the capability to schedule a request for at least one execution. The user shall be provided the capability to schedule product generation.

7.7.1 Background Processing

The VUI shall provide the capability for the user to create a command or batch file to run in the background for a large job.

7.8 Command Line

The VUI shall provide the capability for the user to access the PV-WAVE command line.

7.9 Hyperlink Help

The VUI shall provide the capability for the user to request on-line hyperhelp concerning the functionality of the VUI.

Appendix A: Issues and Concerns

The following issues and concerns have been raised and are presented here to stimulate discussion among the various CCS subteams.

1. Will the database group be archiving the Integrated Command Schedules? If so, how will we access them?
2. Where is the MMM data going to be stored? Will the statistics be stored in a special database whenever they are computed?
3. Will we be able to estimate the amount of CPU time it will take to process a request? If so, this will be a requirement.
4. Is the archive going to store stuff for the ground systems as well as the s/c? Again, if they are, how are we going to access that data?
5. The extensibility of the user interface is a big issue because requirements are going to be pushed back to the second build and will need to be added 'after the fact.'
6. Is dynamically customizing plots feasible with remote processing or, is it better to fill in a form and submit the request. This takes away some user options but might make the code more maintainable.
7. There needs to be a delineation between the requirements for the first and second build.
8. Along these lines, is it practical to have a reduced user interface, such as LoTTS or does that promote the building of 2 user interfaces, one for remote and one for local processing?
9. There needs to be some kind of Monitor Information Table like the one that exists for LoTTS right now.
10. Mnemonics have changed over the years. How is that going to be handled. Is there going to be a merged list?
11. Is there going to be one place where a request is validated whether made from the command line or the user interface? If so, where? If not, the requirements for validation need to be in two places.
12. Is it going to be necessary to have two time stamps, one for apparent event time and the other for data accumulation time?
13. The assumption at this time is that the analysis software will not be doing the processing and storing for trend data.
14. As of yet, the requirements exclude anything associated with Ground Systems Data.

Glossary

ASCII	American Standard Code for Information Interchange
CCS	Control Center System
COTS	commercial, off-the-shelf
GIF	graphical interchange format
GMT	Greenwich mean time
GOTS	government, off-the-shelf
GSFC	Goddard Space Flight Center
HST	Hubble Space Telescope
JPEG	Joint Photographic Experts Group
NASA	National Aeronautics and Space Administration
PDF	portable data format
PS	PostScript™
PV-WAVE	Precision Visuals - Workstation Analysis and Visualization Environment
SGI	Silicon Graphics Inc.
TIFF	tag image file format
UTC	coordinated universal time
VNI	Visual Numerics, Inc.

References

Boia, J. & Mushovic, E. *Evaluation of Analysis and Trending Products for the Hubble Space Telescope (HST) Vision 2000 Control Center System (CCS)*, NASA/Goddard Space Flight Center, March 1996.

Suggestions/Comments

Issue	Reason for not Changing right now...
The option to exclude vs include corrupted data	A discussion needs to be held concerning which will be the default
Suggestion that time should be valid even if stopTime is before startTime(The suggestion was to take the earliest time and make it the startTime)	No
Should raw values be kept for only 1 month with no easy way to access	Needs to be discussed
Why can't a user supplied algorithm be in Fortran or C	Because WAVE will be doing the computations...The GUI will make it relatively easy on the user as far as notation is concerned.
Should changes-only data be the default?	Needs to be discussed
Misleading Title	This is not going to be a published document - it's for the benefit of the SE's and the developers.
MACS don't do Java very well...	That will change soon.
Data may be retrieved as raw, eu and <i>strings</i> ?	Is this true?
It was suggested that VTREND should provide error bars, min/mean/max bars, and double y on generated plots(as a default)	Needs to be discussed